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HERBICIDES

Roadside
Weed and Brush Control

Ontario

Ministry of the Environment

PESTICIDES CONTROL SERVICE

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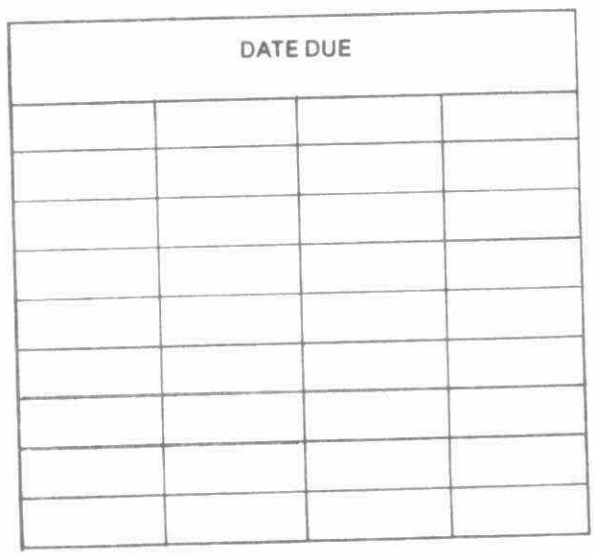

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ONTARIO MINISTRY OF THE ENVIRONMENT

PESTICIDES CONTROL BRANCH

ROADSIDE WEED AND BRUSH CONTROL

1. - INTRODUCTION

A roadside or right-of-way program should be built around the establishment of a weed-free and brush-free sod that is pleasing to the eye and requires a minimum of upkeep. These areas were originally clean of weeds and brush and many have been maintained in this manner. However, some areas have been neglected and all will require maintenance.

Roadside should:

(1) provide a dense grass sod that will aid drainage, prevent erosion, and require a minimum of maintenance;
(2) provide a safe clear area for pedestrians, especially school children;
(3) provide a clear and safe emergency area for vehicles;
(4) provide good visibility, particularly at intersections, to prevent accidents;
(5) provide a clear view of wildlife to prevent unnecessary slaughter and vehicle damage;
(6) be free of weeds and brush to lessen snow problems;
(7) be an example of the control of local weed species;
(8) provide a pleasing, well-kept appearance.

People responsible for road construction and maintenance should take weed control into account. Rights-of-way should be finished so that mechanical weed control can be used. Bare areas should be seeded to a grass mixture that will form a lasting sod and that can be managed with low-cost herbicides.

Fresh fill and newly constructed or graded areas should be watched carefully and steps taken to prevent weeds becoming established. Leafy spurge, yellow rocket, bedstraw, knapweed, goatsbeard, thistle, and, in fact, most weeds are spread during construction. Do not let weeds get started.

It shall be the responsibility of personnel engaged in spray operations to conduct their daily work and conversations with the general public in such a manner as to promote good relations. Care should be taken to assure that no misleading, irresponsible or uninformed statements are made with regard to any part of the spray program. All problems or situations that could lead to a problem should be reported to the proper authorities.

2. - LEGAL ASPECTS OF WEED AND BRUSH CONTROL

The Weed Control Act of Ontario (R.S.O. as amended in 1965 and 1966), Section 3 states: "Every person in possession of land shall destroy all noxious weeds thereon." Under this Act, road authorities are deemed to be in possession of road allowances. Copies of the Act are available from County Weed Inspectors or from the Soils and Crops Branch, Ontario Ministry of Agriculture and Food, 1200 Bay Street, Toronto.

The Ontario Water Resources Commission Act, Section 27 (1) states "It is unlawful for anyone to discharge any material into any water or watercourse that might impair the quality of the water." This Act also regulates the chemicals and maximum rates that can be used without a permit when spraying drainage ditches for emerged aquatic weeds. Further information is available from the Ontario Ministry of the Environment, Biology Branch, Resources Road, Islington, Ontario.

The Pesticides Act 1967, Section 2 (1) states "No person shall engage in, perform or offer to perform an extermination unless he is licensed as an exterminator or is exempt under the regulations." Municipally-owned spray vehicles must be run by or under the supervision of a licensed exterminator. Further information is available from the Ontario Ministry of the Environment, Pesticides Control Branch, One St. Clair Avenue West, Toronto.

In addition to the above Provincial Acts governing spraying operations there are three Federal Acts which affect spraying operations in certain locations. These are The Migratory Birds Convention Act, The Migratory Bird Sanctuary Regulations and The Fisheries Act 1960-61. These Acts cover the placing in water of pesticide chemicals which may be harmful to waterfowl, migratory birds, their nests or eggs, or fish. Where spraying is contemplated in or around the above situations the appropriate Act should be studied prior to spraying. Further, the Pest Control Products Act of Canada governs the registrations and sale of all herbicides sold for use in Canada.

Assistance in setting up a spray program or analyzing an existing one is available from the District Weed Inspectors of the Ontario Ministry of Agriculture and Food. The Ontario Ministry of Transportation and Communications, Ontario Hydro, chemical companies and equipment dealers also have men available to discuss spray programs.

3. - REQUIRED READING

The following publications of the Ontario Ministry of Agriculture and Food should be read and understood by all who plan, supervise, or conduct roadside spray programs. The Ontario Ministry of Transportation and Communications, Ontario Hydro and other utilities have very good publications stressing aspects of weed and brush control as it relates to their situations.

Publication 75, Guide to Chemical Weed Control, is revised annually and contains the most up-to-date recommendations and susceptibility ratings. These recommendations change as new chemicals or practices are proven and accepted. A spray operator should get the current publication each year and use the recommendations as a guide when planning the year's spray operation. Read the manufacturer's label before using any chemical.

Publication 226, 2,4-D Can Damage Crops, is a small publication explaining "risk" locations and listing some precautions to be taken by operators.

Publication 256, Field Weed Sprayers, was prepared as a guide for field crop spraying. However, most of the information in it is just as useful to operators of roadside sprayers. There is information on all aspects of sprayers and many useful charts and tables.

Publication 505, Ontario Weeds, should be studied and used as a basis of weed knowledge. The identification of weeds at all stages of growth and a knowledge of their growing habits is essential to any weedman.

These publications are available from the Agricultural Representative's office, Soils and Crops Specialists, or by writing to the Information Branch, Ontario Ministry of Agriculture and Food, 1200 Bay Street, Toronto.

2,4-D warning signs are available from the Soils and Crops Branch, Ontario Ministry of Agriculture and Food, for posting risk areas. Whether the area is posted or not, the responsibility for spray damage still rests with the operator.

4. - ASSESSING THE WEED PROBLEM

The success of any weed control program whether cultural, mechanical, or chemical will depend on your knowledge of weeds. Weeds are spread mainly by seed and the first concern should be a program to prevent seed formation, particularly in areas where a new weed is becoming established. In areas that are heavily infested, seeds in the soil will continue to germinate for several years. Mowing operations should be timed to discourage regrowth. Growth habit and susceptibilities must be known for each weed species if a spray program is to be effective. You must be able to identify weeds as seedlings and as vegetative plants as well as when in flower.

Weed Classes by Growth Habits

Annuals - those growing from seed and maturing each year, such as ragweed, wild mustard, pigweed, and lamb's quarters. These weeds are usually found in construction areas or where the soil has been disturbed or grass killed. These weeds will be susceptible to a 2,4-D like spray when in their early growth stages but will have to be mowed mechanically or chemically if allowed to flower.

Biennials and Winter Annuals - those with a two-season growth cycle, such as yellow rocket, wild carrot, goatsbeard, burdock and the bull, nodding and Scotch thistles. These weeds start to grow in the summer or late fall but stay in the rosette stage until the following spring. Fall cutting will not affect these weeds but they are susceptible to spray as long as they are growing. These will be the first weeds to show in the spring.

Perennials - those which continue to grow from a root system, such as oxeye daisy, buttercup, Canada thistle, milkweed, bedstraw, and goldenrod. These weeds will usually start growing later in the spring than biennials and will go dormant after seed-set. A few of these weeds will show regrowth in September that could be susceptible to spray depending on the particular weed.

Deep-rooted Perennials - such as leafy spurge, milkweed, and Russian knapweed will require special attention. Areas containing these weeds should be spot-sprayed as more expensive chemicals will be needed. Check current recommendations in Publication 75 for selection of herbicide, timing, and other related details.

AQUATIC weed control presents its own set of problems. The publication "Aquatic Plant and Algae Control" of the Biology Branch, Ministry of the Environment and the section on "Water Weeds" (aquatic plants) in Ontario Ministry of Agriculture and Food Publication 75 should supply both the general information and up-to-date regulations and recommendations.

5. - ASSESSING THE BRUSH PROBLEM

Brush is often a minor problem on roadsides but may be the total problem on utility lines. The type of brush and local circumstances can make brush control as complicated as weed control. Often these programs will complement each other, as a good weed program will control most small brush and a straight brush program will control many weeds. As in weed control the problem must be carefully assessed and properly planned.

Points to consider would include:

(a) a list of species and their growth habits
(b) most practical method and time of application
(c) most effective material or combination
(d) susceptible crops in the area

6. - GROWTH HABITS OF DECIDUOUS AND EVERGREEN BRUSH

Deciduous refers to those species of trees or brush which lose their foliage in the fall and produce new leaves in the spring such as alder, ash, maple, poplar and willow. Publication 75 lists the susceptibilities of the common trees and brush to 2,4-D and 2,4,5-T or a combination.

Evergreen refers to those species of trees or brush that retain foliage year round, such as balsam, cedar, pine, juniper, yew and larch (tamarack). Although larch lose their leaves in the winter, they are classed with the evergreens. Evergreens require a different treatment than deciduous species.

7. - SELECTING HERBICIDES AND TECHNIQUES FOR BRUSH

Because of the wide range of herbicide formulations available in liquid and dry form the operator should be able to select a program that will provide the desired results on all the species present.

Stem Foliage Treatment

This is a spray applied, between the time of full leaf development and the first frost in the fall, to the stems and foliage of the brush in such a manner that both are wet to runoff. It is

applied as a high-volume spray averaging around 100 gal of solution per acre. Growth over 6 or 7 feet, except willow-type brush, should be cut and the regrowth sprayed when it is about three feet tall. Spraying the regrowth will take less material, make it easier to get good coverage, lessen drift problems and leave a better appearance. Formulations of 2,4-D and 2,4,5-T in water are generally recommended. However, when evergreens are present, other chemicals must be used, either alone or in mixtures. See section on "Hazards of Drift."

Basal-bark Treatment

Basal-bark treatment is another method of control of brush or small trees with a trunk diameter of less than six inches. A brush-kill combination of 2,4-D/2,4,5-T or 2,4,5-T is applied in oil to wet the lower trunk and exposed roots thoroughly. Complete wetting of the center stems of clumping bushes is necessary for a kill. This type of control can be applied any time of year on most species. Brush species on the noxious weed list, such as barberry and buck-thorn, are among the hardest to kill and should receive detailed attention.

Stump Treatment

This is a spray applied to the freshly-cut stump to prevent regrowth. A strong solution of 2,4-D/2,4,5-T in fuel oil, Ammate or Sodium Chlorate may be used. The cut surface is sprayed to run-off with enough material to wet the stump thoroughly to ground level and to soak any exposed roots.

Dry Treatment

Several brush-killing chemicals are now on the market for dry application in granular or pellet form. These materials may be applied broadcast or used for individual treatment. These materials are easy to transport or to carry and can be applied by hand. They are excellent for spot treatments.

8. - CHOICE OF EQUIPMENT

The equipment chosen to apply the spray is one which will best apply the herbicide selected for the job in accordance with the most suitable technique.

9. - SELECTING HERBICIDES

You will seldom have a weed or brush problem that can be solved by a single application of any one herbicide. Either the weeds or their location in relation to other vegetation may limit or influence your selection. These products may be packaged in a granular or pellet form to be used as is, or may be a soluble powder that will dissolve in water or a wettable powder that will form a suspension in water and require constant agitation. Liquid materials may mix in water to form a solution or may be oil-based and form an emulsion in water that will require agitation. Emulsions give a milky appearance.

Follow manufacturer's directions accurately in preparing spray materials. Do not use combinations unless recommended on the label or by a competent authority.

Selective Herbicides

Selective herbicides are chemicals that, when used correctly, will kill only certain plants in a treated area. A good example of selectivity is the control of broad-leaved weeds in a lawn or cereal crop. By killing broad-leaved weeds and brush, grasses will be encouraged and most of the roadside requirements mentioned on page 1 will be achieved.

Either 2,4-D or 2,4-D/2,4,5-T combinations are the most common selective herbicides used for roadside weed control.

Advantages of 2,4-D-like herbicides

* Low cost per road-mile.
* Do not kill grass.
* Extremely low toxicity to animals and humans.
* Non-corrosive to metal equipment.
* Can be applied at low pressures.

Disadvantages of 2,4-D-like herbicides

* Effective only on susceptible weeds and brush.
* Time of application is very important for them to be effective.
* Spray drift or vapor drift may damage adjacent crops or ornamentals.

Formulations of 2,4-D and 2,4,5-T

AMINE
* Slower acting than esters.
* Weeds must be in susceptible stage.
* Reduces vapor hazard, but not drift hazard.

* Safer to use if there are susceptible crops in the area.
* Normal spray precautions will apply.
* Slightly higher rates are needed than when using esters.

ESTER
* Faster acting and more effective on semi-resistant species than the amine.
* More effective under adverse weather conditions.
* Will kill more woody species.
* Esters will vaporize and could injure susceptible crops in the area.

LOW VOLATILE ESTER
* Similar in weed kill to the esters but danger from vapor reduced. Most insurance policies require the use of amine or low volatile esters for roadsides.

Other 2,4-D-like chemicals may be needed for spot treatments of deep-rooted perennials. Check labels for hazards such as volatility and residue or other specific precautions required.

Non-Selective Herbicides

Non-selective or contact herbicides are chemicals that affect the foliage of all plants sprayed. These chemicals can cause damage by spray drift but are usually non-volatile. Contact herbicides such as PARAQUAT and DIQUAT become relatively inactive on contact with the soil surface. They will give a quick topkill but will not eradicate perennial weeds or grasses. SODIUM CHLORATE mixtures are contact chemicals and will give soil sterility at higher rates. A combination of sodium chlorate and 2,4-D is sometimes used for quick knockdown and to control deep-rooted broad-leaved weeds.

Growth Retardants

MALEIC HYDRAZIDE has been used to slow down the growth of grass, shrubbery, and trees. This chemical may find a use on steep slopes where the use of equipment to mow grass is difficult or dangerous.

Problems arising from spray drift or vapor drift must be considered when selecting chemicals and these are discussed in the section entitled "Hazards of Drift."

10. - SOIL STERILANTS

The use of soil sterilants around guide rails, sign posts, storage yards, paved medians, bridges and buildings, greatly reduces

the amount of labor necessary to keep these areas free of vegetative growth. Soil sterilants are chemical materials which, when applied to the soil surface, kill existing growth and also prevent new growth for periods of one to three years. Soil sterilants act principally through the roots of the plant. The length of time they remain effective in the soil will depend on the chemical, the rate, application, the species and soil conditions. Atrazine, Simazine, Diuron and Fenuron are examples of sterilants.

Applications on the soil surface require moisture, generally in the form of rain, to be carried down into and distributed through the root zone. The amount of rainfall has a marked influence on the length of time soil sterilants remain active in the soil, and determines the time when applications should be made for best results. Sterilants can leach from the treated area under certain conditions causing damage to the adjacent grassed areas. This leaching has been most apparent on recently completed construction where the turf has not had time to become established or where a heavy rainfall occurred within a few days after application of the herbicide.

The spray should be applied as uniformly as possible at a low spraying pressure. If granulars or dry powder are used they must be applied uniformly and at the recommended rate. The sterilant, when applied to guide rails, should be applied as close to the back of the post as possible in order to keep the leaching to a minimum. Under no circumstances should the solution be spilled or sprayed on any paved areas.

When spraying sterilants, the following precautions should be observed:

(1) Take every precaution to confine the spray pattern to the area to be treated.
(2) Use as low a pressure and as large a tip or nozzle as possible to reduce the possibility of drift damage.
(3) Stop all spraying when the wind is strong enough to carry the spray particles in droplet form (drift) away from the area being treated.
(4) Do not use soil sterilants on recently completed construction projects where movement of the sterilants to untreated areas can be anticipated

11. - SPRAYER OPERATION

Factors Controlling the Application Rate

It is important to understand the factors affecting the rate at which the chemical is applied. The amount of spray material applied to an acre can be changed by changing either the forward speed, or the volume of liquid delivered by the nozzles, or both. The volume of water required per acre will vary with the density of the weed cover and with the amount of brush. The range will usually be from 50 to 150 gal per acre (pga).

Forward Speed of the Sprayer

Any variation in forward speed changes the number of gallons of spray material applied. If the forward speed is doubled, the nozzles will only have half the time to spray material on an acre. The application rate in gallons per acre is then cut in half. Varying the forward speed and nozzle settings within known limits will allow application of a constant rate of chemical per acre by reducing speed where the swath is wider or by increasing the speed where the swath is narrower than normal. The importance of maintaining predetermined speed and pressure uphill or downhill cannot be overemphasized.

Truck speedometers are difficult to read when travelling below 10 mph. A low speed speedometer that is easy to read and measures forward travel in tenths and hundredths of a mile is available from many automotive supply stores (see Publication 256).

Volume Delivered by a Nozzle is Determined by:

(1) the size of the orifice or hole in the nozzle;
(2) the pressure of the spray material at the nozzle.

The size of the orifice in the nozzle is closely controlled when the nozzle is manufactured. However, as the nozzle is used this orifice becomes enlarged and the quantity of spray material delivered increases. Check nozzles for wear by measuring the output per minute at operating pressure. A nozzle should be replaced when the output has increased 10% over the manufacturer's rating.

Note: The distribution of spray material from worn nozzles is not uniform. Check the uniformity of distribution by spraying onto dry pavement. Replace the nozzles if spray pattern is uneven. Check variation in spray pattern at the different boom heights that may be used when spraying.

Pressure

Pressure required should be as low as possible but sufficient to form a proper spray pattern and to penetrate weed cover. Variations in swath width should be made by changing the boom setting. Do not try to widen a swatch by using higher pressure to throw the material farther. Low pressure and large droplets reduce drift. High pressures break the spray into small droplets that will increase the drift hazard.

The pressure of the spray material at the nozzles is controlled by the pressure regulator. If for any reason the pressure changes, the application rate will change. Suppose that a sprayer has been used at a low pressure of 30 pounds per square inch (psi) and that the operator decides to use 60 psi on the next job; the sprayer must be calibrated at the 60 psi pressure. Doubling the pressure will not double the nozzle output.

Note:

5,280 ft per mile	160 sq rd per acre
43,560 sq ft per acre	10 lb water per imperial gallon
320 rd per mile	160 fl oz per imperial gallon

12. - HAZARDS OF DRIFT

Crops such as tomatoes, grapes, tobacco, turnips, beans, and sugar beets, as well as gardens, flowers, and ornamental trees are very susceptible to 2,4-D-like sprays. These herbicides will drift from the area of application either as fine spray droplets or as vapor. Each year a number of spray damage claims are reported. Damage will only be caused when the herbicide moves from the roadside to the susceptible crop.

A major cause of damage is when the operator does not know the location of the susceptible crops. In such cases, all roads should be checked before spraying and 2,4-D warning signs posted. The safe spraying distance from such crops will vary due to growing and weather conditions. This distance can only be judged by your knowledge of the herbicide, the crop, and the existing weather. Always allow a 'maximum' safety margin. It is much cheaper to mow a few rods of roadside than to pay a damage claim. Problems arising from faulty application or a change in weather conditions that cannot be corrected on the job will force an immediate shutdown.

Problems may be caused by either spray or vapor drift

Spray drift is the movement of particles or droplets outside of the spray pattern at the time of application. The extent of the drift will depend on the height at which the spray is released, wind velocity and direction, and the size of the spray droplets. This error may occur as a direct application by improperly set nozzles allowing spray to be applied outside the intended pattern. This damaged area will appear the same as the sprayed area. If the spray pattern is broken by wind gusts or the whole pattern is blown downwind, the damage will vary in distance and severity. If fine particles from the spray pattern drift on a light breeze, damage may occur an embarrassing distance downwind.

Vapor drift is the movement of herbicide vapor that may occur with a volatile herbicide. A volatile herbicide is a chemical that tends to give off vapors at the time of application or after application. The higher the temperature, the more likely it is that some chemicals will vaporize and perhaps be carried to a susceptible crop. This also decreases the effect of the herbicide at the point of application by reducing the amount of chemical remaining.

Sprays should be applied into wind when possible and always downwind from susceptible crops.

Spray Droplet Size and Its Effect on Spray Drift*

Droplet diameter in microns	Type of droplet	Time required to fall 10 ft in still air	Distance droplet will travel in falling 10 ft with a 3 mph breeze
5	Fog	66 minutes	3 miles
100	Mist	10 seconds	409 feet
500 (1/50")	Light rain	1½ seconds	7 feet
1,000 (1/25")	Moderate rain	1.0 seconds	4.7 feet

* Data presented by G.C. Klingman in "Weed Control as a Science"

13. - CALIBRATION

All tanks should be marked to indicate gallons contained at the different levels. Make certain that capacities, measurements, and specification charts are all in, or converted to, "imperial" gallons. Four imperial gallons equal five U.S. gallons.

See Ontario Ministry of Agriculture and Food Publication 256, Field Weed Sprayers, for details on sprayer calibrations, useful charts and formulae.

There are many ways of calibrating a sprayer and determining the number of gallons of spray material that is being applied to an acre of land. Select speed and pressure in advance and maintain it through the test run. After the initial calibration, adjust speed and pressure or change nozzles to give the application rate required. Calibrate again to verify calculations.

Distance Method

Drive the sprayer at operating speed and pressure for 660 feet. (The distance of 660 feet is used to simplify the arithmetic). Measure number of gallons of water used and use this equation:

$$\frac{\text{gallons of water used} \times 66}{\text{width of swath (ft)}} = \text{gallons applied per acre}$$

Area Method

For simple calibration, spray an acre or part of an acre and calculate the gallons per acre applied. Example, a strip $8\frac{1}{4}$ feet wide and one mile (5,280 feet) long, or $16\frac{1}{2}$ feet x $\frac{1}{2}$ mile, or 33 feet x $\frac{1}{4}$ mile, equals one acre, or 43,560 square feet.

Time Method

Another system is to operate the standing sprayer at the required pressure for the time required to travel 660 feet at the speed to be used. Measure water used from the tank or caught at the nozzles and apply the equation used in the "Distance Method".

The gallons of water delivered during a calibration run may be calculated by weighing the vehicle before and after application if there is a weigh scale nearby. The pounds of water used divided by 10 will be the gallons used.

Speed and Time Required to Travel Given Distance

Miles per hour	Time for 330 ft	660 ft	1 Mile
3	1 min 15 sec	2 min 30 sec	20 min
4	56 sec	1 min 52 sec	15 min
5	45 sec	1 min 30 sec	12 min
6	37 sec	1 min 14 sec	10 min

Ministry of Transportation & Communications' Method - Truck Mounted Sprayer

Fill weed spray tank with clear water.
Spray roadside at normal operating pressure for $\frac{1}{2}$ mile at normal speed.
Add clear water, noting number of gallons required to fill the tank.
Multiply number of gallons needed to refill tank by $16\frac{1}{2}$ and divide the result by the sprayed swath in feet. The answer is gallons per acre.

Example: 100 (gallons used) x $16\frac{1}{2}$ = 1650 $\div$ 33 ft(swath width)
= 50 gal per acre.

14. - CALCULATING CHEMICAL REQUIREMENTS

From previous pages and Ontario Ministry of Agriculture and Food Publication 75, Guide to Chemical Weed Control, the type of chemical, formulation, rate per acre and application rate, pressure, and speed should all be determined. Total chemical requirements will be based on the rate per acre times the miles of road converted to acres. This total may have to be converted to pounds or gallons depending on the chemical being used. In some cases, the same herbicide may be purchased as a dry material or as a liquid and prepared in several formulations of each.

Dry Materials

Some dry materials are considered to be totally active, so the rate per acre times the acres will be the same as pounds of product needed.

Example: Granular Atlacide - Weight of the product and pounds used per acre will be the same.

Other dry material may contain inert, or other material, and be only partially active. This is usually expressed as a percentage. Extra pounds of product will need to be purchased to make up this difference.

Example: Atrazine 80W is 80% active. One hundred pounds of product would give only 80 pounds of active herbicide.

Liquid Materials

Liquid materials may be purchased as liquid measure or by weight (pounds or ounces) of acid equivalent per gallon.

Liquid measure:
Example - Liquid Cyanamid

Pounds of acid equivalent per gallon:
Example - Amitrol-T, Paraquat, or TBA.

Ounces of acid equivalent per gallon:
Example - 2,4-D, 2,4,5-T, or Fenoprop.

Converting Miles of Road to Acres

The calculation will depend on the width of the roadside to be sprayed. The width in feet divided by $8\frac{1}{4}$ will give the acres per mile.

Example:

Length of road - 35 miles
Average width of roadside - 22 feet each side
Total width to be sprayed - 22 x 2 = 44 feet

$$\text{Acres to be sprayed} = \frac{22 \text{ (width)} \times 2 \text{ (sides)}}{8\frac{1}{4}} \times 35 \text{ (miles of road)}$$

$$= 186.6 \text{ acres}$$

Acreages per mile will vary due to extra distance on sharp slopes and ditch banks or less width in case of a wider road surface. Herbicide requirements per mile may also vary due to weed and brush growth. Extra chemical should be kept on hand to cover these variations and for spot spray.

Gallons of 2,4-D-like Chemical Required

Acres to be sprayed = 186.6 (from example above)
Rate of herbicide - 2 lb per acre (or 32 oz per acre)
Amount of herbicide required = 2 (lb per acre) x 186.6 (acres)
= 373.2 lb
Herbicide available* contains 96 oz per gal or 6 lb per gal
Gallons of commercial material required

$$= \frac{373.2 \text{ (lb active)}}{6 \text{ (lb active per gal)}} = 62.2 \text{ gal}$$

At least 70 gallons should be ordered.

15. - RECORDS

Spraying records are very important. It is hard to improve a poor program or duplicate an excellent one unless you know what has been done. Record sheets are valuable as a protection against unjustified damage claims. Each sheet should show all details relating to the application or calibration.

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* If the herbicide to be used contains a different amount of active material per gallon, make the necessary changes in the calculation.

16. - WORK SHEETS

Calibration

Date: _____ Operator: _____ Nozzle Size(s)_____

Mph	Psi	Swath Width x Distance	=	Area Covered	Water Used	Application Per Acre

Spray Recommendations

Location: _____ Date: _____ Tank Size: _____
Nozzle Size(s): _____

Chemical and Application Details

Fill in details for any variations in program.

Type of Weed Growth	Herbicide Oz or Lb Per Acre	Gallons Water/Acre	Mph	Psi	Swath Width

Mixing Per Tank

	Tank Capacity	Gal per Acre	Acres per Tank
Water	_____	_____	_____

Chemical Required When Using _____ _____oz/gal or _____lb/gal

Herbicide Oz or Lb/Acre	Acres /Tank	Herbicide Lb/Tank	Gal Product /Tank

Explanation of Record Form

(see work sheet on pages following)

1. Location: Designate road by County road number or Township Concession number, or accepted road, or street name. Specific points should be named to indicate start and finish of each day's work, e.g. from 1st to 10th concessions. Indicate side of road by N,S,E or W, or e.g. N & S, for both north and south sides of the road. If necessary, use additional lines for additional roads sprayed on the same date.

2. Miles sprayed: Report as known road mileage or from speedometer reading of the actual sprayed mileage.

3. Report average width of spray swath in feet.

4. Record gallons of chemical and water added at each refill.

5. Record gallons applied per road and total per day.

6. Temperature and wind direction are important. If wind velocity can be measured, report in mph. If not, report as light, moderate, or high.

7. Type of vegetation: Report as weeds or brush, name predominating species.

8. Under Remarks, report special circumstances - rainfall, high wind, susceptible crops - which may influence decision to spray or not.

9. This form is of the type required to record pertinent information on spraying operations, and should be available for reference when required. Municipalities, whether contracting or using their own equipment, should provide the operator with these report forms and insist on having them accurately completed.

Municipality _____ Unit _____

Operator _____ Driver _____

Rate _____ Oz or Lb/Acre _____ Gal Water/Acre _____

Chemical ____ Trade and Common Name and Strength _____

DAILY SPRAY RECORD

Date	Road No	Side Sprayed	Location From To	Miles Sprayed	Average Width of Spray Swath	Gallons Chem/Water At Fill Up	Gallons of Spray Used	Temperature	Water Direction	Wind Velocity	Type of Vegetation Sprayed	Remark

17. - SAFETY CHECK

1. Always read and understand the information and instructions on the label before mixing or applying any herbicide.

2. Respect all chemicals and use only as recommended.

3. Know exactly what rate is being applied.

4. Keep your machine in top condition, repair or replace nozzles, gauges, valves, gaskets and hoses at first sign of trouble.

5. Know the location of susceptible crops in the area.

6. Know your weeds and their habits of growth.

7. Avoid unnecessary application in watercourses, ponds and well areas.

8. Applications to drainage ditches and aquatic weeds must be closely supervised.

9. Do not wash out spray equipment in lakes, ponds, streams or where runoff could affect a well. Apart from toxicity to fish, 2,4-D and related herbicides can taint water and fish flesh.

10. Dispose of all containers properly.

11. Store chemicals as recommended.

12. Handle all containers so that labels remain intact and are easily read. If a label is damaged, relabel and use at first opportunity.

13. Prepare sprayer for storage as the manufacturer recommends.

14. Keep records of spray operation and calibrations.

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